



Mbed OS 5.12.4あたりの 最近の状況

Seeed
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自己紹介



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ネットワークに繋がるマイコン、
開発ツールを作るのが好きなMaker



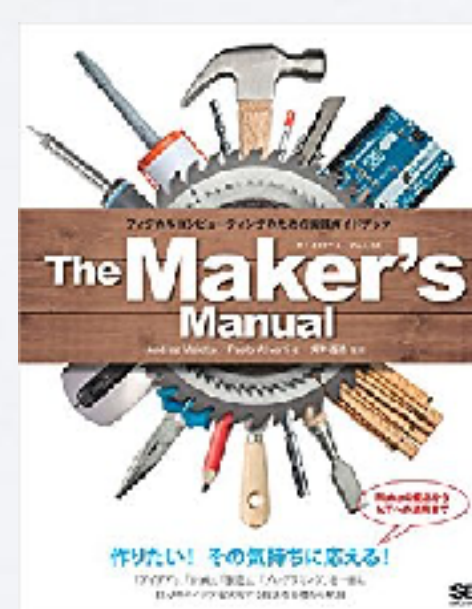
2009



2010-2015



2015-2018



2016



2017



2018



<https://www.aps-web.jp/academy/mbed/>

本日のネタ

- ・ Mbed Studioがやってきた！
- ・ ARMC6がやってきた！
 - ・ 使い方
 - ・ Mbed OS 5.12.4にすると幸せ。
 - ・ ~~ARMv8-Mもやってきた！~~
- ・ Bare Metalがやってきた！

▶ Mbed Studioがやってきた！

<https://os.mbed.com/studio/>



TSUBOI Yoshihiro @ytsuboi · 2月26日

Mbed Studioが出たよー。WindowsとmacOSがサポートされていて、コンパイラはなんとarmccですよー!!! os.mbed.com/studio/



Overview ▾ Hardware ▾ Docs ▾ Code ▾ Support ▾ Built with Mbed ▾

Mbed Studio

The desktop IDE for Mbed

Mbed Studio is an IDE for Mbed OS 5 application and library development, including all the dependencies and tools you need in a single package so that you can create, compile and debug your Mbed programs on the desktop.

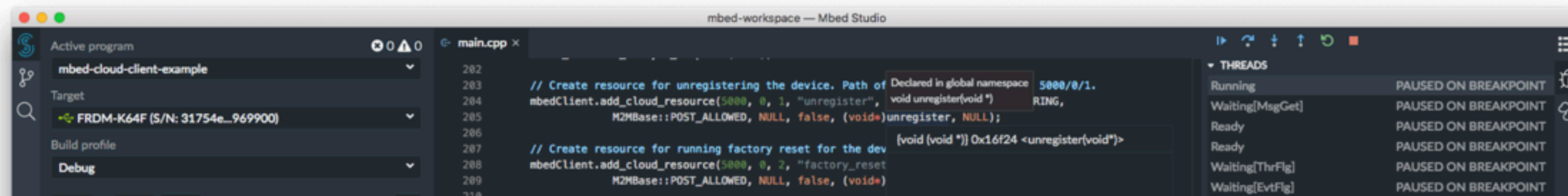
Download for Windows

Download for Mac

[Documentation »](#)

Studio

The desktop IDE for Mbed



▶ Theiaを使っているのが良い！

The screenshot displays the Mbed Studio IDE interface. The central pane shows a C++ code editor with the following code:

```
202
203 // Create resource for unregistering the device. Path of 5000/0/1.
204 mbedClient.add_cloud_resource(5000, 0, 1, "unregister", void unregister(void *)
205                               M2MBase::POST_ALLOWED, NULL, false, (void*)unregister, NULL);
206
207 // Create resource for running factory reset for the dev {void (void *)} 0x16f24 <unregister(void*)>
208 mbedClient.add_cloud_resource(5000, 0, 2, "factory_reset
209                               M2MBase::POST_ALLOWED, NULL, false, (void*)
210
211 mbedClient.register_and_connect();
212
213 #ifndef MBED_CONF_MBED_CLOUD_CLIENT_DISABLE_CERTIFICATE_ENR
214 // Add certificate renewal callback
215 mbedClient.get_cloud_client().on_certificate_renewal(ce
216 #endif // MBED_CONF_MBED_CLOUD_CLIENT_DISABLE_CERTIFICATE_EN
217
218
219 // Check if client is registering or registered, if true
220
221 while (mbedClient.is_register_called()) {
222     static int button_count = 0;
223     mcc_platform_do_wait(100);
224     if (mcc_platform_button_clicked()) {
225         button_res->set_value(++button_count);
226     }
227 }
228
229 // Client unregistered, exit program.
230 }
231
```

The left sidebar shows a file explorer for the project 'mbed-cloud-client-example', listing folders like 'BUILD', 'configs', 'drivers', and 'source', along with various configuration files and source code files.

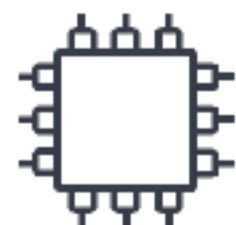
The bottom pane is divided into several sections: 'Problems', 'Output', 'Mbed Libraries', and 'Debug Console'. The 'Debug Console' shows memory usage statistics for the 'mbed-cloud-client-example' target:

Component	Address	Size	Usage
abed-os/drivers	6370 (+0)	0 (+0)	148 (+0)
abed-os/events	2289 (+0)	0 (+0)	3144 (+0)
abed-os/Features	177443 (+0)	194 (+0)	55763 (+0)
abed-os/hal	2226 (+0)	4 (+0)	68 (+0)
abed-os/platform	5823 (+0)	80 (+0)	1488 (+0)
abed-os/rtos	15127 (+0)	160 (+0)	7650 (+0)
abed-os/targets	27620 (+0)	12 (+0)	1162 (+0)
abed_cloud_dev_credentials.o	1549 (+0)	0 (+0)	0 (+0)
oource/app_platform_setup.o	493 (+0)	0 (+0)	0 (+0)
oource/application_init.o	2451 (+0)	0 (+0)	0 (+0)
oource/blink.o	530 (+0)	1 (+0)	0 (+0)
oource/certificate_enrollment_user_cb.o	1266 (+0)	0 (+0)	0 (+0)
oource/platform	2540 (+0)	0 (+0)	06 (+0)
oource/resource.o	451 (+0)	0 (+0)	0 (+0)
update_default_resources.o	75 (+0)	0 (+0)	0 (+0)
update_ui_example.o	410 (+0)	0 (+0)	6 (+0)
Subtotals	425125 (+0)	711 (+0)	79163 (+0)

The 'Debug Console' also shows memory usage for static RAM (79874 bytes) and total flash memory (425836 bytes). It includes update and image information for the target.

The right sidebar contains a 'THREADS' panel showing several threads in a 'PAUSED ON BREAKPOINT' state, a 'CALL STACK' panel showing the current call stack, and a 'VARIABLES' panel showing local and global variables.

▶▶ Debugもあるよ！



Platform Detection

Plug in an Mbed Enabled platform (board or module) and Mbed Studio will detect it automatically.



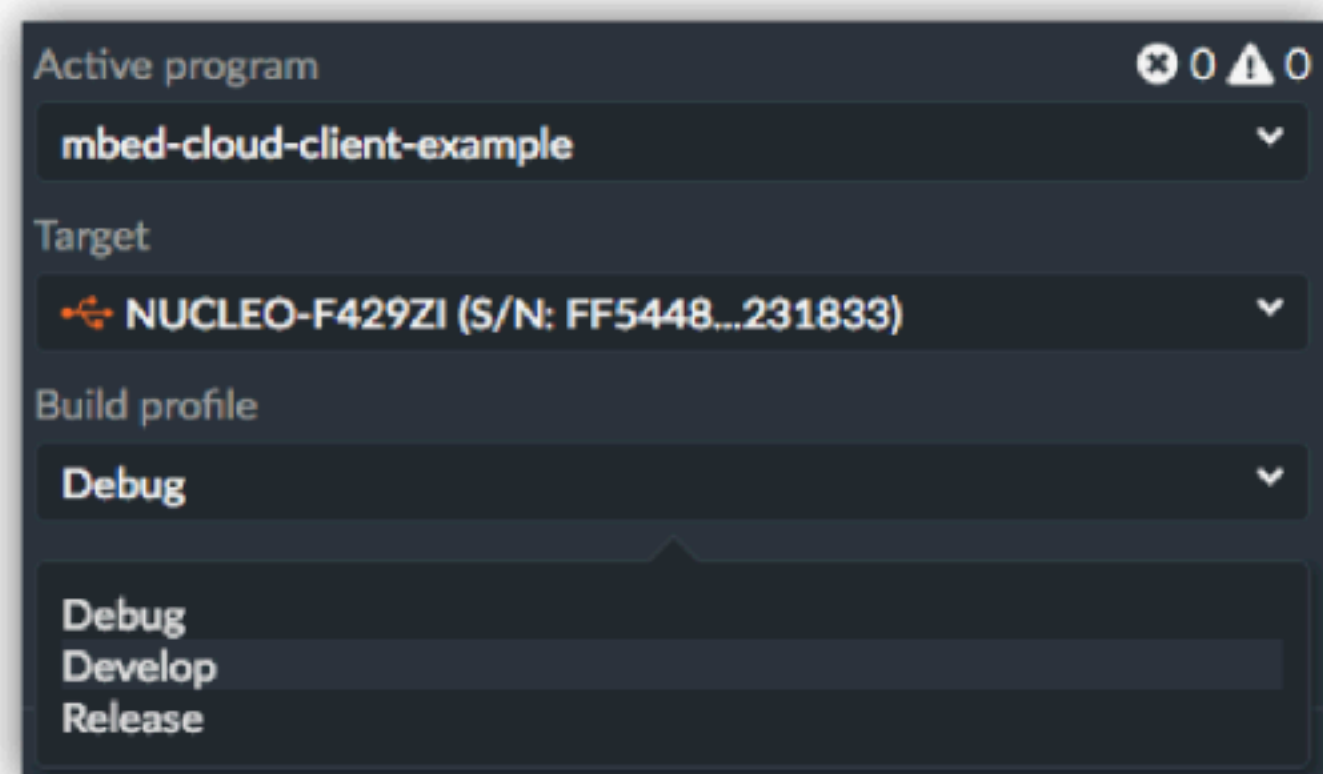
Automatic deployment

Mbed Studio takes care of flashing your code directly to your platform.



Mbed OS Debug

Build your software with a pre-defined debug profile, and then launch a debug session with a single click.



Arm Compiler 6

Build your code with Arm Compiler 6, included for free with Mbed Studio. With no restrictions on code size or optimization levels, you can get the most out of your MCU and focus on your application development.

Arm Compiler 6 has been used to build the code for billions of embedded devices, so your next IoT product is in good company.

[Learn more on developer.arm.com](https://developer.arm.com) »

▶▶ Arm Compiler 6って？



- Armによるコンパイラ最適化が素晴らしい。
- LLVMベース
- Arm v6-M, v7-Mだけでなくv8-Mにも対応
- Keil MDK-Armなどの商用のIDEに採用
→けっこうなお値段を払ってライセンスを
持っていますがWindows版😭

▶▶ そんなに最適化すばらしいの？

<http://os.mbed.com/teams/Seeed/code/mbed-os-example-wio-cellular/>

```
$ mbed compile -m WIO_BG96 -t GCC_ARM
```

```
Total Static RAM memory (data + bss): 24392(+24392) bytes  
Total Flash memory (text + data): 171444(+171444) bytes
```

```
$ mbed compile -m WIO_BG96 -t ARMCC
```

```
Total Static RAM memory (data + bss): 23666(+23666) bytes  
Total Flash memory (text + data): 158738(+158738) bytes
```


▶ mbed-cliで

```
$ mbed compile -m LPC55S69_NS -t ARM
[mbed] Working path "/Users/yoshi/mbed/mbed-os-example-wifi" (program)
[mbed] Auto-installing missing Python modules (pywin32, wmi)...
Building project mbed-os-example-wifi (LPC55S69_NS, ARMC6)
Scan: mbed-os-example-wifi
Link: mbed-os-example-wifi
[Warning] @0,0: L3912W: Option 'legacyalign' is deprecated.
Elf2Bin: mbed-os-example-wifi
Post-Build: mbed-os-example-wifi
```

Module	.text	.data	.bss
[lib]/c_w.l	17499(+0)	16(+0)	348(+0)
[lib]/fz_wm.l	1538(+0)	0(+0)	0(+0)
[lib]/lib_power.ar	664(+0)	0(+0)	0(+0)
[lib]/libcpp_w.l	1(+0)	0(+0)	0(+0)
[lib]/libcppabi_w.l	44(+0)	0(+0)	0(+0)
[lib]/m_wm.l	746(+0)	0(+0)	0(+0)
anon\$\$obj.o	82(+0)	0(+0)	124768(+0)
main.o	1676(+0)	4(+0)	4(+0)
mbed-os/components	15552(+0)	0(+0)	2893(+0)
mbed-os/drivers	3072(+0)	0(+0)	0(+0)
mbed-os/events	1961(+0)	0(+0)	3108(+0)
mbed-os/features	13348(+0)	163(+0)	161(+0)
mbed-os/hal	1578(+0)	4(+0)	66(+0)
mbed-os/platform	6215(+0)	64(+0)	272(+0)
mbed-os/rtos	13631(+0)	168(+0)	6634(+0)
mbed-os/targets	10978(+0)	8(+0)	514(+0)
Subtotals	88585(+0)	427(+0)	138768(+0)

```
Total Static RAM memory (data + bss): 139195(+0) bytes
Total Flash memory (text + data): 89012(+0) bytes
```

Image: ./BUILD/LPC55S69_NS/ARM/mbed-os-example-wifi.hex

使い方

```
$ mbed import https://github.com/ARMmbed/mbed-os-example-wifi
$ cd mbed-os-example-wifi/
$ vi mbed_settings.py
$ cd mbed-os
$ mbed update mbed-os-5.12.4
$ cd ..
$ mbed compile -m LPC55S69_NS -t ARM
$ cp ./BUILD/LPC55S69_NS/ARM/mbed-os-example-wifi.hex /
Volumes/LPC55S69/
```


▶▶ ポイントその1

mbed_settings.pyにARM_C6_PATHを書いておく。

```
ARM_C6_PATH = "/Library/Application Support/Mbed Studio/mbed-studio-tools/ac6/bin"
```

▶▶ ポイントその2

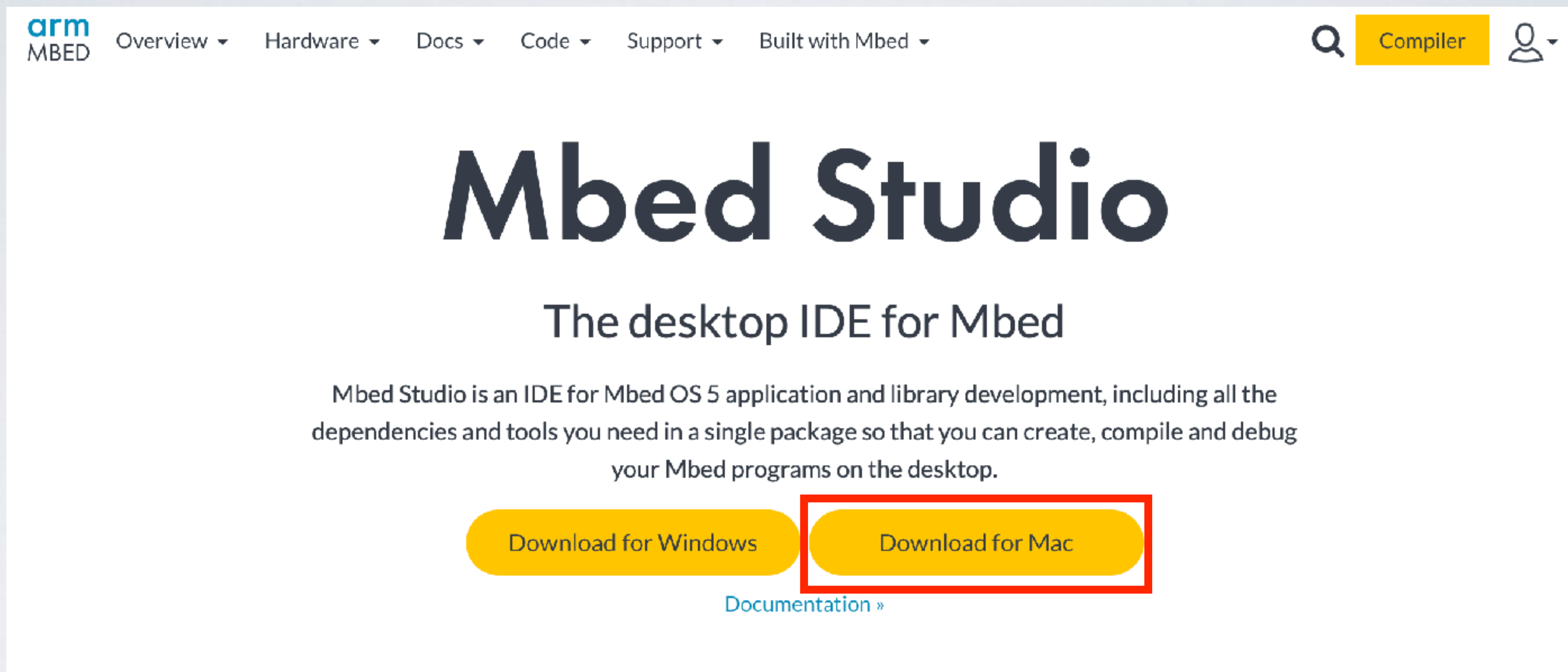
Mbed OS 5.12.4以上にしておく。

```
$ mbed update mbed-os-5.12.4
```

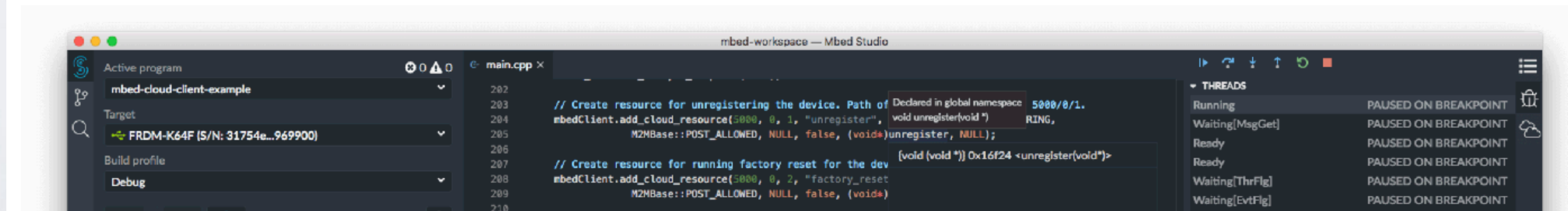
ARMv6サポートは、5.12以降。

5.12.3までは、バグがあってアセンブラでエラー出ます。

▶ Mbed Studioですが...



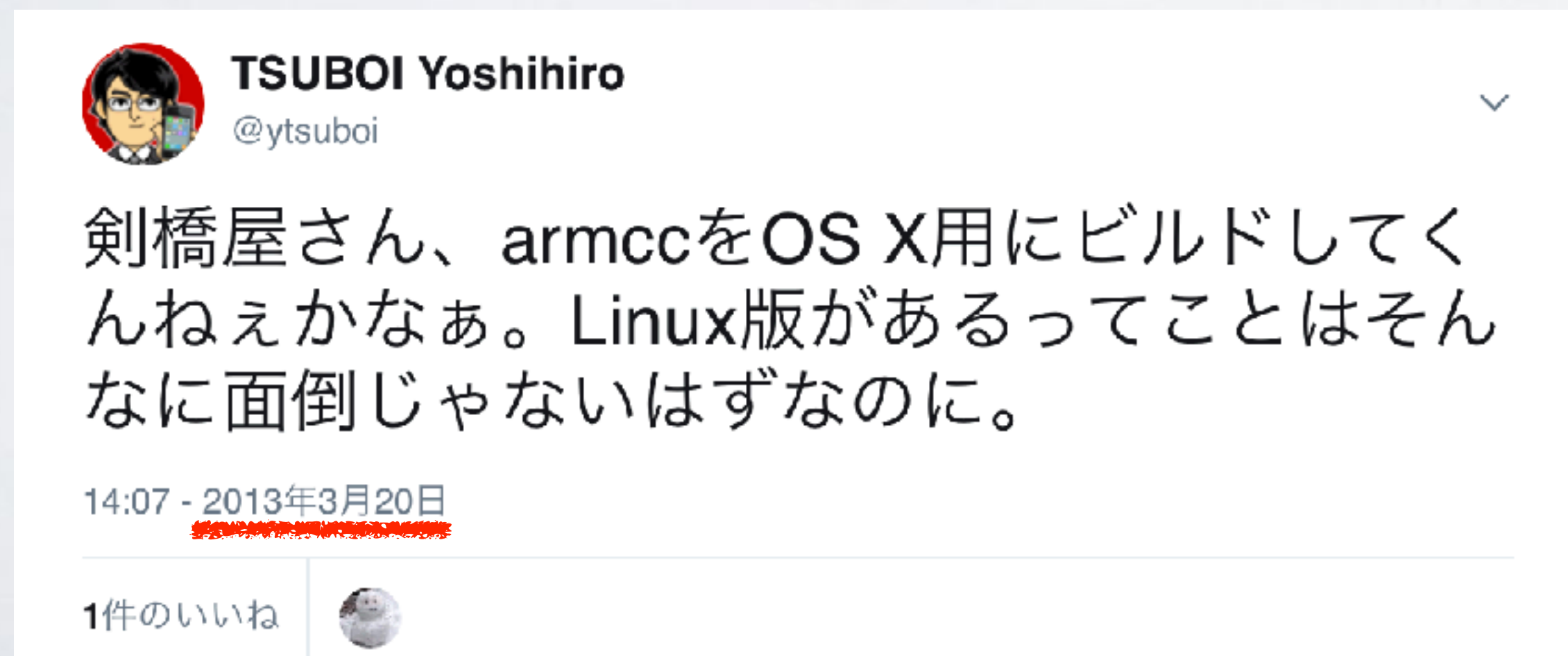
The screenshot shows the Mbed Studio website homepage. At the top left is the 'arm MBED' logo. The navigation menu includes 'Overview', 'Hardware', 'Docs', 'Code', 'Support', and 'Built with Mbed'. On the top right, there is a search icon, a yellow 'Compiler' button, and a user profile icon. The main heading is 'Mbed Studio' in a large, bold font, followed by the subtitle 'The desktop IDE for Mbed'. Below this, a paragraph describes Mbed Studio as an IDE for Mbed OS 5 application and library development. At the bottom of the main content area, there are two yellow buttons: 'Download for Windows' and 'Download for Mac'. The 'Download for Mac' button is highlighted with a red rectangular border. Below the buttons is a link for 'Documentation »'.



The screenshot shows the Mbed Studio IDE interface. The title bar reads 'mbed-workspace — Mbed Studio'. The interface is divided into several panels. On the left, there is a sidebar with 'Active program' (mbed-cloud-client-example), 'Target' (FRDM-K64F [S/N: 31754e...969900]), and 'Build profile' (Debug). The main area displays a C++ code editor with a file named 'main.cpp'. The code includes comments and function calls like 'mbedClient.add_cloud_resource'. A tooltip is visible over a function call, showing its signature: 'void unregister(void *)'. On the right side, there is a 'THREADS' panel showing a list of threads, all of which are in a 'PAUSED ON BREAKPOINT' state.

▶ 個人的に2019Q1一番の感動

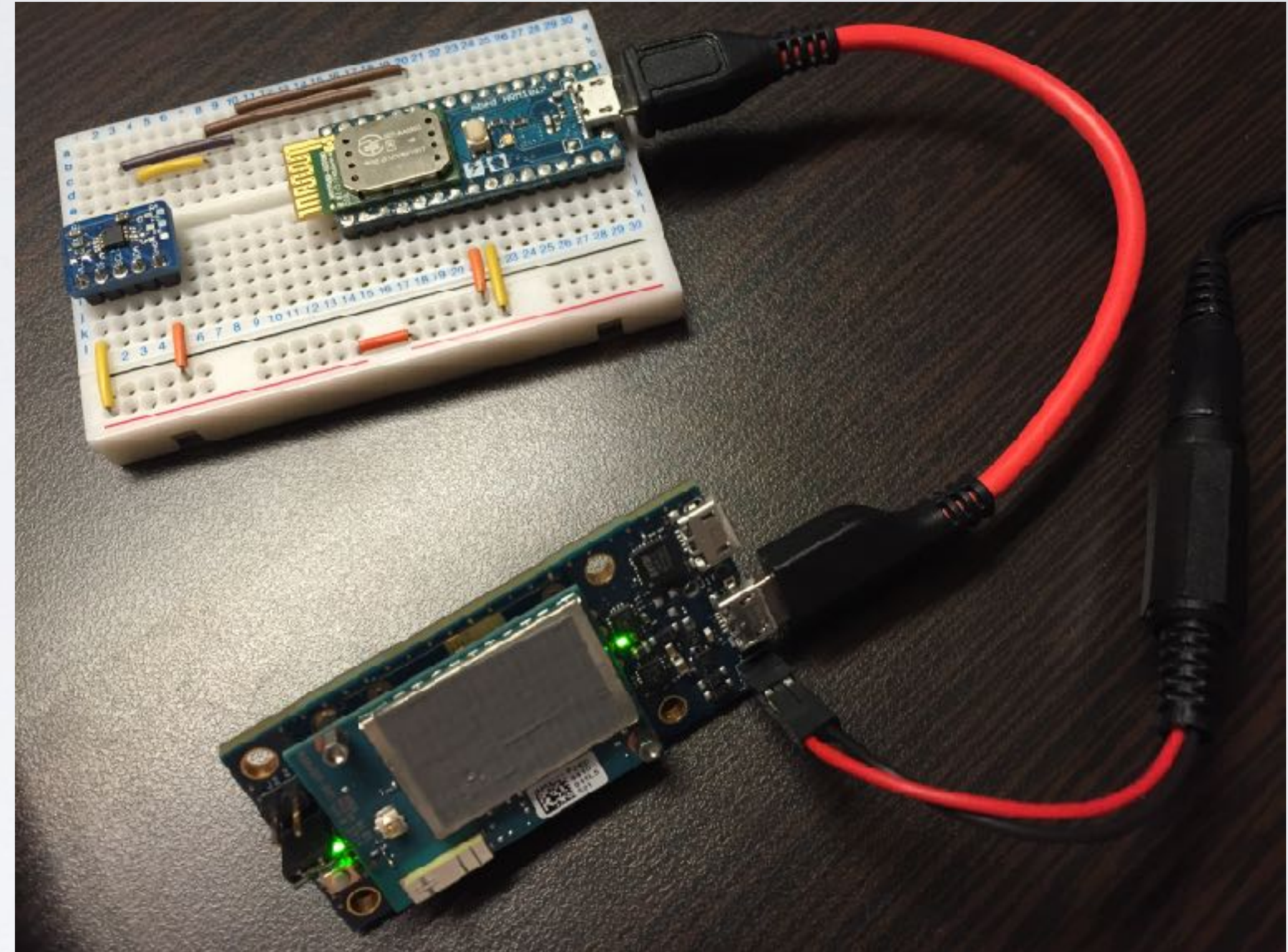
armccがmacOSで使える！



←6年越しの悲願実現！

▶ Linux版といえは。

2014年にDS-5のライセンスで。



```
root@ubilinux:~# armcc --vsn  
ARM C/C++ Compiler, 5.02 [Build 28]  
For support see http://www.arm.com/support/  
Software supplied by: ARM Limited
```


このときは、armccのライセンスを持っている人があまり居ないからgccでもやっけてプレゼン作りしましたが...

誰でもMbed Studioのおかげで、
ARMC6をWindowsとmacOSで使える！

ところで...

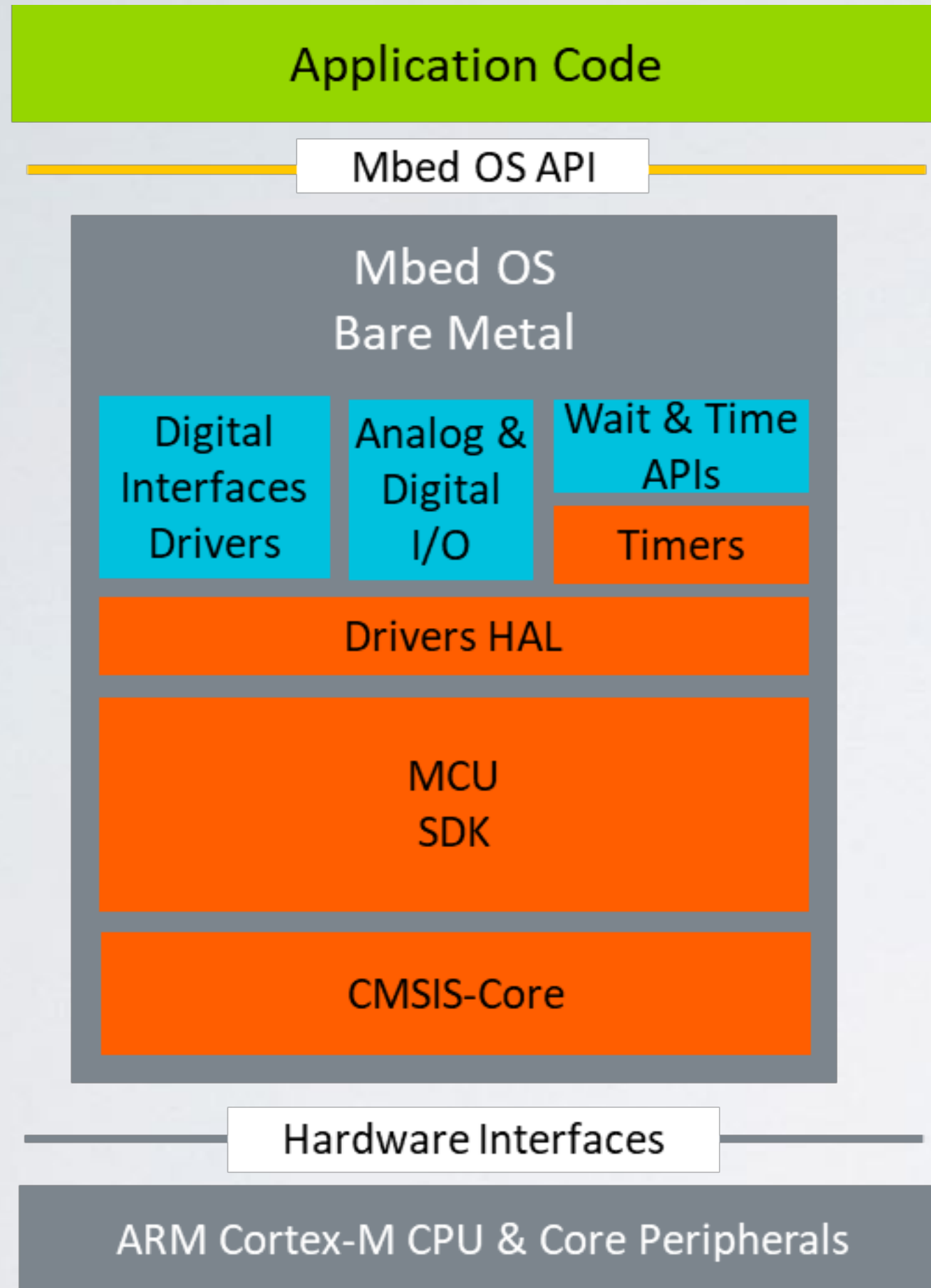
Mbed OSはRTOS付いててデカいやん🙄

Mbed Classicはよかったなあ…

▶▶ よくあるご意見

- ・ 俺の使いたいマイコンのRAM 4Kなんだけど
- ・ ちょっとGPIO / I²C / SPI使いたいだけなのでRTOS要らない
- ・ SysTickうぜえ (1ms毎に割り込み入る)
例: Mbed OS + SPI + NeoPixelで嵌まった話

▶▶ bare metal profileがやってきた！



Features	Mbed OS 5 bare metal	Mbed OS 5
Analog I/O	Available	Available
Digital I/O	Available	Available
Digital interfaces	Available	Available
Timers	Available	Available
Development tools (For example, Mbed CLI, Mbed Studio, Mbed Online Compiler, GCC, Arm Compiler 6 and so on)	Available	Available
Support for Mbed Enabled development boards	Available	Available
RTOS	Not available	Available
Storage	Ecosystem libraries	Available
Mbed TLS	Not available	Available
Mbed PSA	Not available	Available

mbad bare metal


Customers, Mbed OS partners, community

Partner components & ports

Mbed OS components

▶▶ 使い方は簡単！

mbed_app.jsonに、

```
Raw Blame History     
4 lines (3 sloc) | 35 Bytes  
1 {  
2     "requires": ["bare-metal"]  
3 }
```

って書くだけ。

▶▶ すごいスリム効果

Before:

Total Static RAM memory (data + bss): **6916**(+6916) bytes

Total Flash memory (text + data): 22379(+22379) bytes

Bare metal profile:

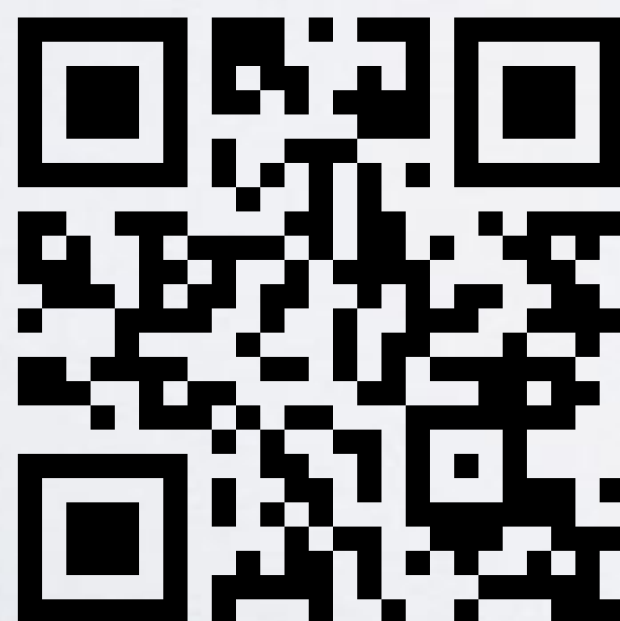
Total Static RAM memory (data + bss): **672**(-6244) bytes

Total Flash memory (text + data): 11184(-11195) bytes

▶ フォロワー、いいね！お願いします。



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